GrafitV

Interactive and personalized information system over audiovisual content

NEM Summit 2012
Agenda

- Introduction and objectives
- General Architecture and Operation
  - Graphics generation
  - Tracking
  - Transmission and synchronization
  - Playback, display and information updating
  - Personalization
- Conclusions and future work
Introduction

- There is an increasing need to **obtain specific information** through the most accessible device **at any time**. As **mobile devices** (smartphones or tablets) allow **Internet access** it is possible to obtain immediate information over different topics.

- **TV** has experienced a **great growth** in the last years. Users can interact with the television, which was unthinkable just few years ago. This fact has motivated the **appearance of widgets**, which are applications specifically designed for television.

- **Current widgets** show their interface and the content requested by the users over the audiovisual content, thus **reducing the vision of the live content**.

- Moreover, this additional information appears in a **fixed position** and is **shown according to the scheduling** (in a certain time) and the user **cannot add or remove** this information from the display.
Objectives

**GrafITV**

- Interactive and personalized information system over future audiovisual content in real time

- Used by new connected TVs and mobile devices with multimedia capabilities (tablets or smartphones)

- The system allows the personalized insertion of additional information through graphics, synchronization on audiovisual content as well as object detection over images in real time
General Architecture and Operation

- Audiovisual content
  - Tracking manager
  - Tracking application
- Graphics generation application
  - Graphics repository
- Graphics manager
- Personalization manager
  - Synchronization application
- Data and statistical repository

- Transmission Synchronization manager
- Display application for fixed devices
- Display application for mobile devices
- Display manager
- Update information application
- Play
Graphics generation – Requirements

- The **graphics generation application** generates the graphics of the GrafiTV system and stores them in the graphics repository (containing the format of the graphics to be shown).

- The application also recommends the suitable graphics for each use case through the **graphics manager**. The most appropriate graphic is selected depending on the information to be shown or generates a new graphic if it does not exist.

- The platform has been specifically designed to support the generation and the display of 3D graphics.

- The repository information is accessible through a web service.
Currently, there are no systems that carry out an automatic synchronization with the audiovisual content & inserted graphical information.

Among the several technologies used to generate and display 3D graphics and information over audiovisual content in real time, we do remark:
- WebGL
- O3D
- XML3D
Tracking application and manager

**The tracking application**
- Carries out the patterns, people or objects detection, identifying them in the video
- Tracks the movements of the selected element during the video frames in order to obtain the **position of the objects**.

**The tracking manager**
- Is in charge of knowing the pattern that the tracking application must search
- Provides the tracking application with the images or the video so that the application can look for the information on the video
- Obtains the positioning information of the desired element in the frame to be shown.
One of the main interactive visualization problems in real time is the detection and later tracking of the objects by means of a sequence of images.

The choice of a detection algorithm depends on the features of the object to be detected:

- In case of detecting fixed images, such as the number of a player, the SURF algorithm stands out for pattern recognition.
- When willing to detect the face of a player, face detection techniques are used.
Some of the most relevant tracking techniques are:
- **Lucas-Kanade (KLT) method**
- **Movement pattern estimators**

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Transmission and synchronization

- The **transmission of the video** and the **enriched multimedia content transmission** is made through the transmission and synchronization block.

- This block **synchronizes** the **additional information** together with the **audiovisual content** displayed using the metadata encapsulated with the video flow.

- Two main approaches to deal with the enriched content:
  - Broadcast
  - Internet
Transmission and synchronization: Broadcast

The transmission of the video and the enriched multimedia content is made through the transmission and synchronization block. This block synchronizes the additional information together with the audiovisual content displayed using the metadata encapsulated with the video flow.

Two main approaches to deal with the enriched content:
- Broadcast
- Internet
**Video and enriched content** are managed through **web browsers**

**Internet technologies** allow to combine different formats and content sources on a single user interface

**Main standards**
- CE-HTML
- HTML5
Features of the **display manager:**

- Implements the visualization of the audiovisual content
- Includes the combination of the main media stream with all the synthetic graphics
- Displays the information requested by the user on the screen
- Displays all the information received by the display manager according to the viewer selected criteria
- Performs user interface functions to display the GrafiTV settings menu
- Direct communication with the updating application to update the information shown on the screen
Personalization

- The personalization manager communicates with all the platform managers to make the GrafiTV system work.

- It processes all the user requests and stores all the preferences from the users of the GrafiTV system.

- It communicates with:
  - **Graphics manager**: The personalization manager requests information about new graphics requested by the user. The graphics or objects to be shown will depend on the information requested, the display mode, the application and the device where the application is running.
**Personalization**

- **Tracking manager**: When there is a need to change any pattern to identify on the video, the tracking manager detects special patterns of the different events in order to locate the information referred to them in a nearby point.

- **Transmission and synchronization manager**: The personalization manager informs about all the information that must be sent to the display manager, as well as the graphics and additional data to be sent.

- **Display manager**: When the user requires additional information of a certain event, the personalization manager is in charge of serving the requested information.
Conclusions and future work

- GrafiTV project improves the **Quality of Experience** of the users since it provides **interactivity** and **personalization** services.

- Step forward on the information society as it offers **interactive information services synchronously merged with audiovisual content**.

**Future objectives:**

- Development of this service on current smart television platforms.
- Develop a widget or application integrated in televisions.
- Allow users to create additional repositories where they can include their own information and comments.
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Thanks for your attention